MIL-I-2819A
13 AUGUST 1959

SUPERSEDING
MIL-I-2819
23 AUGUST 1951

MILITARY SPECIFICATION

INSULATION BLOCK, THERMAL

This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 Scope. This specification covers thermal insulation block for insulating machinery and equipment.

1.2 Classification. Block shall be of the following classes, as specified (see 6.1):

Class 1 — Temperatures up to 500° Fahrenheit (F.).

Class 2 — Temperatures up to 1,000°F.

Class 3 — Temperatures up to 1,500°F.

2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

PPP-B-585 — Boxes; Wood, Wirebound.

PPP-B-591 — Boxes, Fiberboard, Wood-Cleated.

PPP-B-601 — Boxes, Wood, Cleated-Plywood.

PPP-B-621 — Boxes, Wood Nailed and Lock-Corner.

PPP-B-636 — Boxes, Fiber.

PPP-T-60 — Tape, Pressure Sensitive Adhesive, Waterproof—for Packaging and Sealing.

PPP-T-97 — Tape, Pressure-Sensitive Adhesive, Filament Reinforced.

MILITARY

MIL-B-10377 — Boxes; Wood-Cleated, Veneer, Paper Overlaid.

MIL-L-10547 — Liners, Case, Waterproof.

STANDARDS

MILITARY

MIL-STD-105 — Sampling Procedures and Tables for Inspection by Attributes, and

FSC 5640

Appendix — Sampling for Expensive Testing by Attributes.

MIL–STD–129 — Marking for Shipment and Storage.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

2.2 **Other publications.** The following documents forms a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

OFFICIAL CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd Street, New York 16, N. Y.)

AMERICAN SOCIETY FOR TESTING MATERIALS STANDARDS

C165 — Compressive Strength of Preformed Block-Type Thermal Insulating, Standard Method of Test for.

C177 — Thermal Conductivity of Materials by means of the Guarded Hot Plate, Standard Method of Test for.

(Application for copies should be addressed to the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa.)

3. REQUIREMENTS

3.1 **Qualification.** The insulation block furnished under this specification shall be a product which has been tested and has passed the qualification tests specified in section 4 (see 6.1).

3.2 **Material.** The insulation block shall be composed of heat-resisting compounds suitable for the temperature conditions and the purpose intended.

3.3 **Composition.** The insulation block shall conform in all respects to the composition obtained on the sample submitted for qualification (see 4.5.1).

3.4 **Shape and dimensions.** Insulation block shall be flat and rectangular and shall be furnished in the following dimensions, as specified (see 6.1):

	Inches
Thickness	As required
Width	3, 6
Length	18, 36

3.4.1 *Tolerances.* A tolerance of plus ¼ inch in length and plus ⅛ inch in width and thickness will be permitted. No minus tolerances will be permitted.

3.5 **Resistance to vibration.** The insulation block shall be in satisfactory condition upon completion of the test specified in 4.5.2.

3.6 **Physical requirements.** The insulation block shall conform to the physical requirements shown in table I.

3.7 **Workmanship.** The workmanship shall be first class in every respect.

4. QUALITY ASSURANCE PROVISIONS

4.1 Unless otherwise specified herein the supplier is responsible for the performance of all inspection requirements prior to submission for Government inspection and acceptance. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order.

4.2 **Qualification tests at a laboratory.** Qualification tests shall be conducted at a laboratory designated by the Bureau of Ships. These tests shall consist of the tests specified in 4.5.

TABLE I. *Physical requirements*

	Class 1	Class 2	Class 3
Density, pounds per cubic foot, maximum	15.0	23.0	27.0
Compressive strength, at 10 percent deformation, min. p.s.i.	50.0	50.0	50.0
Resistance to abrasion, loss in weight, percent, maximum			
After first 10 minutes	40.0	50.0	40.0
After second 10 minutes	70.0	80.0	60.0
Modulus of rupture, pounds per square inch, minimum	[1]	[1]	[1]
Change under soaking heat, 6 hours at °F.	500	1,000	1,500
Compressive strength, at 10 percent deformation, min. p.s.i.	50.0	50.0	50.0
Loss in weight, percent, maximum	18.00	12.00	10.00
Linear shrinkage, percent, maximum	2.00	5.00	5.00
Moisture absorption, percent by volume, maximum	1.00	3.00	3.00
Thermal conductivity, B. t. u./hr./sq. ft./°F./inch, maximum, at a mean temperature of			
300°F.	0.56	...	...
550°F.	...	0.66	...
800°F.	...	...	0.76

[1] Three times density (pounds per cubic foot) of the sample tested.

4.3 Sampling.

4.3.1 *Lot.* For purposes of sampling, a lot shall consist of all insulation block of the same class thickness, width, and length produced under essentially the same conditions and offered for delivery at one time.

4.3.2 *Sampling for visual and dimensional examination at the place of manufacture.* A random sample of insulation block shall be selected by the Government inspector from each lot offered for Government inspection in accordance with Standard MIL–STD–105 at inspection level II. The Acceptance Quality Level shall be 1.5 percent defective.

4.3.3 *Sampling for acceptance inspection at a Government laboratory.* A random sample of blocks shall be selected from each inspection lot in accordance with the appendix to Standard MIL–STD–105 at inspetion level L–4 for the tests specified in 4.4.2. Unless otherwise specified in the contract or order, the tests shall be conducted at the U. S. Naval Engineering Experiment Station.

4.4 Inspection and tests.

4.4.1 *Visual, dimensional and density examination.* Each of the sample blocks selected in accordance with 4.3.2 shall be visually and dimensionally examined and the density determined by the Government inspector to verify compliance with this specification. Any block in the sample containing one or more visual, dimensional, or density defects shall be rejected, and if the number of defective blocks in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected. Rejected lots may be offered again for Government inspection provided the contractor has repaired or removed all nonconforming blocks.

4.4.2 *Acceptance inspection.* Each of the sample blocks selected in accordance with 4.3.3 shall be subjected to the tests specified in 4.5.3, 4.5.4, 4.5.5, 4.5.6 and 4.5.7 and to

any additional tests deemed necessary by the Government laboratory to determine that the samples conform with that given qualification. If any sample block fails one or more of these tests, the lot shall be rejected. Rejected lots may be resubmitted for acceptance tests provided the contractor has removed or reworked all nonconforming products.

4.5 Test procedures.

4.5.1 *Composition.* The composition shall be determined by chemical analysis using accepted laboratory methods.

4.5.2 *Resistance to vibration.* Two blocks shall be mounted on the faces of an electrical heater plate. The ends of the heater plate shall be insulated and the entire assembly shall be fitted and mounted with a 1/16-inch - thick sheet-iron casing. The casing shall be mounted in a vertical position on a vibration test apparatus. The heater plate shall be maintained at the maximum temperature for the respective class during the test. The assembly shall be subjected to 720 vibrations per minute through an arc of 15 minutes for a period of 100 to 400 hours of operation. At the end of each 100-hour period of operation, the outer metal casing of the assembly shall be removed and the condition of the blocks noted.

4.5.3 *Density.* The sample shall be measured and weighed and the density shall be calculated to determine compliance with table I.

4.5.4 *Compressive strength.* The compressive strength shall be determined in accordance with the method specified in ASTM Standard C–165.

4.5.5 *Resistance to abrasion.* Twelve 1-inch cube specimens of the material and twenty-four 3/4-inch oak cubes (specific gravity of the wood 0.65) shall be placed in an oak having inside dimensions of 7 1/2 by 7 3/4 by 7 3/4 inches. The opening of the box shall then be closed and fastened, and the box rotated about its own axis at a speed of 60 revolutions per minute for two 10-minute periods. The horizontal axis of rotation of the box shall be normal to and in the center of the 7 3/4 by 7 3/4 inch face. At the end of each 10 minute period, the cubes of the material shall be removed from the box. The box shall be cleaned, and the cubes of the material under test shall be weighed to determine the percentage loss in weight due to pulverization and breakage (see table I).

4.5.6 *Modulus of rupture.* Four specimens, 6 inches wide and 12 inches long shall be taken for test to determine conformance with table I. The thickness and the width shall be measured to the nearest 0.01 inch. The specimen shall be supported flatwise on parallel supports 10 inches apart and the load applied gradually at midspan on a bearing parallel to the end supports. The bearing and supports shall be rounded to a radius of approximately 3/8 inch. The bearing load shall be recorded to the nearest 5 pounds. The modulus of rupture shall be calculated from the following formula:

$$R = \frac{3W1}{2bd^2}$$

Where:

R = Modulus of rupture (pounds per square inch).

W = Breaking load (pounds).

1 = Length of span (inches).

b = Width of specimen (inches).

d = Thickness of specimen (inches).

4.5.7 *Physical changes under soaking heat.* Specimens shall be weighed and measured. Then the specimens shall be placed in an electrically heated oven and subjected to the maximum temperature for the respective class for 6 hours. The specimens shall be removed from the oven and tested to determine loss of weight, linear shrinkage, and hardness (see table I).

4.5.8 *Moisture absorption.* Specimens shall be subjected to an atmosphere of 90 percent relative humidity at 120°F. dry-bulb temperature for 6 hours. The increase in weight shall be noted and recorded as percentage increase in weight and volume.

4.5.9 *Thermal conductivity.* The sample shall be such as to provide specimens in the form of disks 8 inches in diameter by 1 inch thick. Conductivity shall be determined in accordance with the method specified in ASTM Standard C–177 at several temperatures on the hot side between 300° and 600°F. for class 1, 450° and 1,100°F. for class 2, and 450° and 1600°F. for class 3 (see table I).

4.6 Inspection and tests of preparation for delivery requirements. The packing and marking of the equipment shall be subject to inspection and tests by Government inspector to determine compliance with the requirements of section 5 of this specification. The contractor shall provide the necessary facilities and supplies for inspection and tests made prior to final acceptance.

5. PREPARATION FOR DELIVERY

5.1 Packing.

5.1.1 *Level A.* Blocks of one class and size shall be packed in wood cleated fiberboard, nailed wood, fiber, wirebound wood, wood cleated veneer paper overlaid, or wood cleated plywood boxes conforming to Specification PPP–B–591 (overseas type), PPP–B–621 (class 2), PPP–B–636 (class 3), PPP–B–585 (class 3), MIL–B–10377 (overseas type) or PPP–B–601 (overseas type) respectively at the option of the contractor. Shipping containers shall have case liners conforming to Specification MIL–L–10547. Case liners shall be closed and sealed in accordance with the appendix to Specification MIL–L–10547. Case liners for boxes conforming to Specification PPP–B–636 may be omitted provided all joints and corners of the boxes are sealed with a minimum 2 inch wide tape conforming to type 1 or 2, class 1 of Specification PPP–T–60. Boxes shall be closed and strapped in accordance with the applicable box specification or appendix thereto, except fiber boxes shall be banded with tape conforming to type III of Specification PPP–T–97 and the appendix thereto. The gross weight of wood or wood-cleated boxes shall not exceed 200 pounds; fiber boxes shall not exceed the weight limitations of the applicable box specification.

5.1.2 *Level B.* Blocks of one class and size shall be packed in wood cleated fiberboard, nailed wood, wirebound wood, wood cleated plywood, wood cleated veneer paper overlaid or fiber boxes conforming to Specification PPP–B–591 (domestic type), PPP–B–621 (class 1), PPP–B–585 (class 1), PPP–B–601 (domestic type), MIL–B–10377 (domestic type), or PPP–B–636 (class 2), respectively, at the option of the contractor. Box closure shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood or wood cleated boxes shall not exceed 200 pounds; fiber boxes shall not exceed the weight limitations of the applicable box specification.

5.1.3 *Level C.* Blocks shall be packed in containers in a manner which will insure acceptance by common carrier and safe delivery to destination. Shipping containers shall comply to the Uniform Freight Classification ratings, rules and regulations or other regulations as applicable to the mode of transportation at the lowest cost.

5.2 Marking. In addition to any special marking specified in the contract or order, shipping containers shall be marked in accordance with Standard MIL–STD–129.

6. NOTES

6.1 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Class required (see 1.2).

(c) Thickness, width and length required (see 3.4).

(d) Selection of applicable levels of packing required (see 5.1).

6.2 Qualification. With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List QPL–2819, whether or not such products have actually been so listed by that date.

6.2.1 The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is the Chief of the Bureau of Ships, Department of the Navy, Washington 25, D.C., and information pertaining to qualification of products may be obtained from that activity.

Preparing activity:
Navy—Bureau of Ships
(Project 5640-0002)

Military custodians:
Army—Corps of Engineers
Navy—Bureau of Ships
Air Force

☆ U. S. GOVERNMENT PRINTING OFFICE: 521538—1959—(V-16)